5.1 Renewable Portfolio Standards

Policy Description and Objective

Renewable Portfolio Standards (RPS) provide states with an opportunity to increase the amount of renewable energy in a cost-effective, market-based approach that is administratively efficient.

Summary

A renewable portfolio standard (RPS) requires electric utilities and other retail electric providers to supply a specified minimum percentage (or absolute amount) of customer load with eligible sources of renewable electricity. As of September 2005, RPS requirements have been established in 21 states plus Washington, D.C., and are a key driver for new renewable electric generation facility development in the United States (Figures 5.1.1a and 5.5.1b). Over 2,300 megawatts (MW) of new renewable energy capacity through 2003 is attributable to RPS programs (Petersik 2004). RPS is cited as the driving force behind the installation of approximately 47% of new wind capacity additions in the United States between 2001 and 2004 (Wiser 2005).

Many states have adopted RPS requirements because they are an administratively efficient, cost-effective, and market-based approach to achieving renewable electricity policy objectives. RPS requirements can be used in both regulated and restructured electricity markets.

States have tailored their RPS requirements to satisfy particular state policy objectives, electricity market characteristics, and renewable resource potential. Consequently, there is wide variation in RPS rules from state to state with regard to the minimum requirement of renewable energy, implementation timing, eligible technologies and resources, and other policy design details.

Figure 5.1.1a: Projected New Renewable Capacity by 2015 Attributable to Existing RPS Requirements
(California compared to all other states)

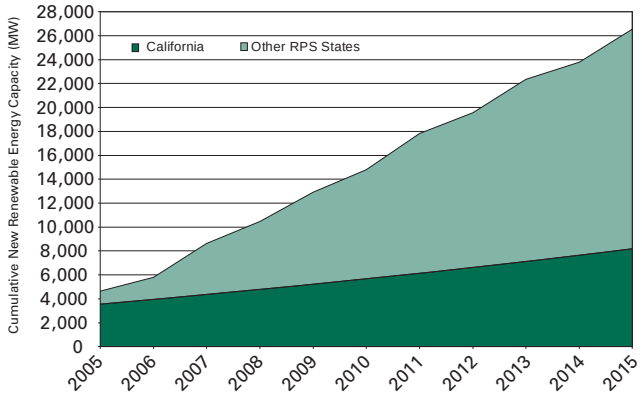
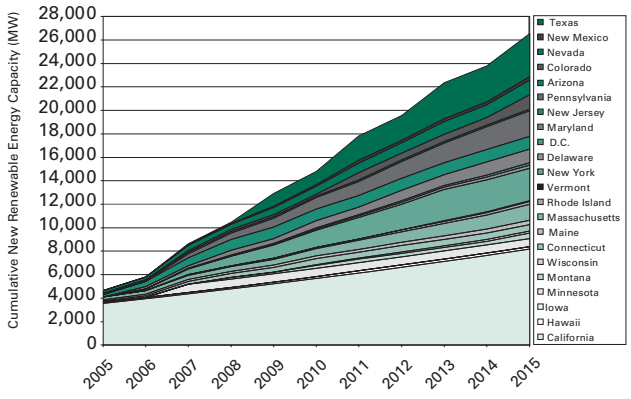


Figure 5.1.1b: Projected New Renewable Capacity by 2015 Attributable to Existing RPS Requirements
(comparison of all other states)



Source: Navigant 2005.

Electricity suppliers must demonstrate compliance with RPS requirements by any of these three mechanisms:

- Purchase electricity from a renewable facility inclusive of all renewable attributes (sometimes called "bundled renewable electricity").
- Purchase renewable energy certificates (RECs). A REC is a tradable right (separate from the electrical energy itself) to claim the environmental and other attributes associated with 1 megawatt-hour (MWh) of renewable electricity from a specific generation facility.
- Own a renewable energy facility and its output generation.

As of September 2005, 16 states allow the use of RECs to satisfy RPS requirements. Unlike bundled renewable energy, which is dependent on physical delivery via the power grid, RECs can be traded between any two parties, regardless of their location.[17] However, state RPS rules typically condition the use of RECs based on either location of the associated generation facility or whether it sells power into the state or to the regional grid. (A more detailed explanation is provided in Figure 5.1.6 on page 5-10.)

Objective

States create RPS programs because of the energy, environmental, and economic benefits of renewable energy. Many states have also adopted RPS programs to stimulate market and technology development and, ultimately, to help make renewable energy competitive with conventional forms of electric power.

Examples of broader goals and objectives that the state may want to prioritize in the RPS design process include:

- Local, regional, or global environmental benefits.
- Local economic development goals.
- Hedging fossil fuel price risks.
- Advancement of specific technologies.

Benefits

The benefits of an RPS are the same as those from renewable energy and combined heat and power (CHP)[18] in general:

- Environmental improvement (e.g., avoided air pollution, climate change mitigation, waste reduction, habitat preservation, conservation of water and other valuable natural resources).
- Increased diversity and security of energy supply, with greater reliance on domestic, regional, and in-state resources.
- Reduced volatility of power prices given the stable (or nonexistent) fuel costs of renewables.
- Possible reduction of wholesale market prices due to low bid prices of intermittent renewables in competitive wholesale markets.
- Mitigation of natural gas prices due to some displacement of gas-fired generation.
- Local economic development resulting from new jobs, taxes, and revenue associated with new renewable capacity.

Because it is a market-based program, an RPS has several operational benefits:

- Achieves renewable policy objectives efficiently and with relatively modest impacts to customer bills. State analyses performed prior to implementation of RPS requirements have shown that annual ratepayer impacts result in increases of less than 1% and savings of up to 0.5%, with the impact on residential bills of a few dollars a year (DSIRE 2005, Navigant 2005; see Figure 5.1.2). States have found the importance of performing analyses in conjunction with the design of an RPS to ensure the level is not set too high, which would result in higher costs.

[17] RECs represent the attributes of electricity generated from renewable energy sources. When they are sold or traded with the physical electricity, they are considered bundled. They can be unbundled and sold or traded separately as two commodities.

[18] CHP is an efficient, clean, and reliable approach to generating power and thermal energy from a single fuel source by recovering the waste heat for use in another beneficial purpose.

Figure 5.1.2: A Sampling of the Impacts of RPS Requirements on Ratepayers

State	Incremental Target	Overall Rate Impacts	Average Impact on Resdential Bill
CA	41,000 GWh (2010)	Savings: 0.5% in 2010	Savings: $3.5/yr in 2010
CO	4,500 GWh (2020)	Savings: 0.5% expected value	Savings: $2.4/yr expected values
IA	4,400 GWh (2015)	Savings: 0.3% on average	Savings: $3.4/yr on average
MN	6,300 GWh (2010)	Savings: 0.7% on average	Savings: $4.6/yr on average
NY	12,000 GWh (2013)	Cost: 0.32% in 2009	Cost: $3/yr in 2009
PA	17,000 GWh (2015)	Cost: 0.46% on average	Cost: $3.5/yr on average
WA	14,300 GWh (2023)	No impact	No impact
WI	7,500 GWh (2013)	Cost: 0.6% on average after 2010	Cost: $3.3/yr on average after 2010

Source: Wiser 2005.

- Spreads costs associated with RPS requirements among all customers.
- Minimizes the need for ongoing government intervention.
- Functions in both regulated and unregulated state electricity markets.

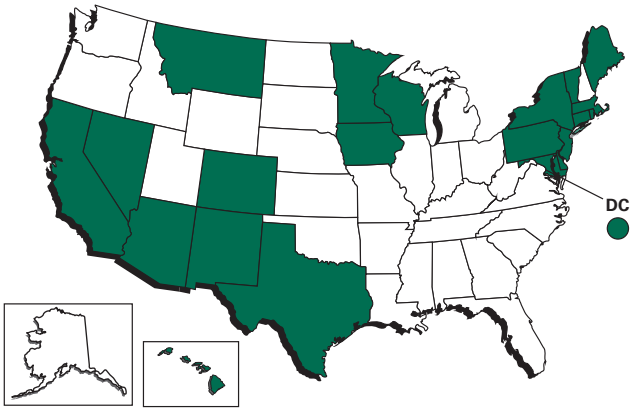
States are often finding that RPS requirements provide a cost-effective approach to achieving energy and environmental goals. RPS requirements typically lead to market development of the most cost-competitive forms of renewable energy (currently wind power in most cases), unless designed to encourage higher-cost renewable technologies.

States with RPS Requirements

As of September 2005, 21 states and Washington, D.C. have established RPS requirements (see Figure 5.1.3). Eight states enacted RPS rules in 2004 alone. In addition, Illinois has adopted legislation with a renewable energy goal of at least 5% by 2010, and at least 15% by 2020 (DSIRE 2005, Navigant 2005). The legislation does not include a verification process or any noncompliance penalties. Tremendous diversity exists among these states with respect to the minimum requirements of renewable energy, implementation timing, and eligible technologies and resources (see Figures 5.1.4 on page 5-6 and 5.1.5 on page 5-7). After initial enactment, several states have fine-tuned the RPS rules to reflect new technology, resource, or policy considerations that may have changed over time.

Initially, RPS requirements emerged as a part of deregulation of the electricity sector. Recently, however, states that are not deregulated have begun to adopt RPS requirements with an eye towards other policy concerns, such as rising natural gas and coal

Figure 5.1.3: States with RPS Requirements



Note: In Minnesota, an RPS is applicable only to the state's largest utility, Xcel Energy, which is required by special legislation to build or contract for 125 MW of biomass electricity and 1,125 MW of wind by 2011. The other Minnesota utilities must make a good faith effort to meet a Renewable Energy Objective, which is not mandatory.

Sources: DSIRE 2005, Navigant 2005.

Figure 5.1.4: State RPS Requirements

	Target	Solar
AZ	**1.1% by 2007**	0.66% by 2007
CA	**20% by 2017**	
CO	**10% by 2015**	0.4% by 2015
CT	**10% by 2010**	
DC	**11% by 2022**	0.386% by 2022
DE	10% by 2019	
HI	105 MW (2% by 1999)	
IA	105 MW (2% by 1999)	
MA	4% by 2009 (+1%/year after)	
MD	7.5% by 2019	
ME	30% by 2000 incl. some non-RE	
MN[a]	10% by 2015 (1% biomass)	
MT	5% in 2008, 10% in 2010, 15% in 2015	
NJ	6.5% by 2008	0.16% (95 MW) by 2008
NM	5% by 2006, 10% by 2011	
NV	6% by 2005, 20% by 2015	5% of portfolio
NY	25% by 2013	0.154% customer-sited by 2013
PA	18% by 2020 (8% is RE)	0.5% by 2015
RI	16% by 2019	
TX	2.7% or 2000 MW new by 2009, 880 MW existing preserved	
VT	Total incremental energy growth between 2005 and 2012 to be met with new renewables (cap 10% of 2005 sales)	
WI	2.2% by 2011	

[a] See note concerning Minnesota's RPS in Figure 5.1.3.

Sources: DSIRE 2005, Navigant 2005.

prices or climate change. To date, eight states have enacted RPS requirements as part of restructuring legislation, and 14 states have enacted RPS requirements outside of restructuring.

Designing an Effective RPS

This section describes key elements to consider in designing effective RPS requirements. These elements include participants, goals and objectives, applicability of the program, eligible technologies, program structure, and administration. The discussion that follows reflects lessons learned from states' experiences in developing and implementing RPS requirements. In addition, this section provides insights on interactions of the RPS requirements with other state and federal policies.

Participants

A number of organizations are involved in the design of RPS requirements:

- *State Legislatures.* Typically, the state legislature enacts legislation to mandate RPS requirements. However, legislation is not always necessary to introduce RPS requirements. For example, in Colorado, RPS requirements were mandated by a state ballot initiative. In New York, the state Public Utility Commission (PUC) established RPS requirements under its existing regulatory authority at the request of the governor. Governors have become increasingly involved in shaping RPS-related policies.
- *State PUCs.* State PUCs and other state agencies are generally tasked with establishing the detailed rules governing RPS requirements. In crafting detailed RPS rules, state agencies follow the intent and requirements of the enabling legislation but sometimes must resolve technical and policy issues that can influence the effectiveness of the program. In Arizona and New Mexico, RPS requirements were adopted via a regulatory process before being codified by the legislature. As of September 2005, a similar process is ongoing in Illinois.
- *Renewable Electricity Generators.* The efforts and ability of renewable electricity generators to build new facilities are critical to the success of RPS requirements. Therefore, the legitimate commercial needs of these generators are an important component of the design phase and can be addressed by facilitating long-term contracts.
- *Utilities.* Whether deregulated or vertically integrated, utilities are crucial entities in the successful implementation of RPS requirements. Ensuring that utility needs are addressed (e.g., recovery of compliance costs associated with RPS requirements) is vital to make RPS requirements effective.
- *Competitive Electric Service Providers (ESPs).* In states that have restructured, competitive ESPs that provide generation service to customers may be subject to RPS requirements. Administrative feasibility, flexibility, and compliance provisions are key concerns of many ESPs.

- *Other Stakeholders.* Developing RPS rules has involved numerous other stakeholders, including state and local government officials, environmental organizations, ratepayer advocates, labor unions, trade associations, project developers, and others.

Goals and Objectives

States have found that RPS have multiple goals, and some states aim for a broader set of objectives (Rader and Hempling 2001). As described in the *Objective* section (page 5-4), examples of the broader goals and objectives include:

- Local, regional, or global environmental benefits
- Local economic development goals
- Hedging fossil fuel price risks
- Advancement of specific technologies

These broader goals and objectives can serve as a guide to design choices for RPS requirements. It is important, therefore, to clearly articulate these goals and objectives in order to avoid protracted rule implementation debates and, ultimately, to produce the best RPS design for the state.

Applicability and Eligibility

A common element of RPS requirements is the *applicability* to investor-owned utilities and electric service providers. It is highly unusual for RPS requirements to extend to municipal utilities and cooperatives as these entities are predominately self-regulated.

Successful states have ensured that *eligibility* of a resource or technology reflects whether or not it supports the goals and objectives established for the RPS requirements. States are finding that defining which renewable energy resources and technologies qualify as eligible under RPS requirements can be a complicated process with multiple issues to consider. Issues that states have considered include:

- *Technologies and Fuel.* Which fuel sources and energy production technologies will be eligible?

Figure 5.1.5: Eligible Technologies Under State RPS Requirements

	AZ	CA	CO	CT	DC	DE	HI	IA	MA	MD	ME	MN	MT	NJ	NM	NV	NY	PA	RI	TX	VT	WI
Biomass	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Cogeneration				●			●				●					●		●				
Energy Efficiency							●									●		●				
Fuel Cells[a]				●							●	●		●	●			●				
Geothermal	●	●	●		●	●	●			●	●		●	●	●	●		●	●	●		●
Hydro		●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●
Landfill Gas	●	●	●	●	●	●	●		●	●	●		●	●	●	●	●	●	●	●	●	●
Municipal Waste		●		●	●		●	●		●	●	●	●	●		●		●			●	
Ocean Thermal		●		●	●	●	●		●	●							●		●	●		
Photovoltaics	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Solar Thermal Electric	●	●		●	●	●	●		●	●	●	●	●		●	●		●		●	●	●
Tidal		●		●	●	●			●	●	●			●			●		●	●		●
Transportation Fuels							●															
Waste Tire		●									●											
Wave		●		●	●	●	●		●	●				●			●		●	●		●
Wind	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

[a] All states shown in this figure allow fuel cells using fuel from eligible renewable sources to count towards the state's RPS. States shown in the fuel cell row also allow fuel cells to meet the RPS regardless of whether the input fuel is derived from a renewable resource.

Sources: DSIRE 2005, Navigant 2005.

Some fuel sources are universally accepted (such as wind and photovoltaics [PV]) with almost no technology or project limitations. Other fuels have been excluded (e.g., municipal solid waste [MSW] or nuclear power) or conditioned on qualifying project technologies (e.g., run-of-river hydro), project scale (e.g., "small" hydro), or project performance characteristics (e.g., "low emission" biomass combustion). For example, nine states do not consider MSW as eligible in their RPS (see Figure 5.1.5 on page 5-7).

- *Existing Versus New.* How are existing renewable resources to be treated? Do they count toward RPS compliance or not? States have typically set a date to establish what is considered an existing renewable resource versus what is new. Some state rules are designed to prevent existing renewables from capturing additional revenues relating to the RPS, which could increase ratepayer costs but not the amount of renewable generation.
- *Geographic Zone.* In what geographic area must the resources be located to be eligible in the RPS requirements (e.g., energy generation just within the state boundary or energy generation within a regional power market)? RPS requirements and other policies in neighboring states may affect this decision. To address this, states have performed cost-benefit analyses of the geographic zone and available resources. Strict in-state eligibility requirements may raise legal concerns under the Interstate Commerce Clause.
- *Central Versus Customer-Sited.* How are grid-tied and off-grid customer-sited systems considered? Are there reasons why they are treated differently?

RPS requirements have varied tremendously with respect to eligibility. Some states, such as Maine, employ fairly expansive definitions of eligible renewable electricity including both existing and new facilities, large hydro (up to 100 MW), MSW, and efficient CHP facilities (regardless of fuel source). Other states, such as Massachusetts, use a much narrower definition that excludes renewable generators in operation before the RPS requirements (unless refurbished or repowered), excludes hydro and MSW, and limits biomass facilities based on their emission performance. Still other states, such as Pennsylvania, allow energy efficiency, waste heat recovery, and certain fossil fuel generation to qualify under a more expansive "alternative energy" portfolio standard. States with more permissive eligibility provisions in RPS rules typically require a higher percentage of renewable energy than states with more restrictive definitions of eligible resources.

Structure

While RPS requirements are varied and are a relatively new policy tool, experience with some program elements to date have identified best practices for structuring RPS requirements. These elements of structure include:

- *Energy Versus Capacity.* Most states have chosen to base RPS requirements targets on energy production (MWh) rather than installed capacity (MW). An energy production metric provides more incentive to use the renewable resources and, therefore, to achieve the benefits that an RPS is designed to create.
- *Time Horizon.* Adequate time is required to establish, implement, and create new renewable electricity facilities and markets. Therefore, RPS requirements with sufficiently long timelines will enable markets to develop and provide project developers and investors time to recover capital investments. Many RPS rules have been established for an extended period of time, often with an end date no earlier than 10 years after RPS requirements are fully operational. RPS requirements that are built to last will go a long way toward inspiring confidence among developers and financiers.
- *Mandatory or Voluntary.* Longevity of RPS requirements is crucial in getting projects financed. Instilling investor confidence in the REC market and other trading mechanisms related to RPS requirements is vital to developing new renewable energy projects.

  Most states use a mandatory structure with financial consequences for noncompliance. An RPS that is not enforced may do little to provide investors with sufficient assurance that financial returns

will be adequate to invest in new renewable facilities, especially when renewable energy options are more expensive than conventional power supplies. In addition, compliance obligations that apply to the broadest possible group of retail sellers, including default service providers, will increase demand for renewable resources. State laws that enable inclusion of municipal utilities in RPS requirements also reduce the potential for bias in retail energy markets and broaden the base of intended benefits from RPS requirements. For example, the Colorado RPS includes municipal utilities and cooperative utilities, but they can opt-out or self-certify. If they self-certify, compliance reports are for informational purposes only.

Enforcement options are numerous, but a number of states use an Alternative Compliance Payment (ACP). Under such a policy, in the event that a retail supplier cannot meet its RPS, it may instead pay a per-kilowatt-hour (kWh) charge for the amount by which it is out of compliance. The ACP rates vary, generally ranging from 1 to 5 cents per kWh, with even higher amounts for solar-specific RPS requirements. Some states "recycle" payments to support renewable energy development. (See the *State Examples* section on page 5-14 for examples of ACPs.)

- *Renewable Energy Mix.* States may have policy interests in promoting particular renewable energy technologies and deployment locations to advance market competitiveness or other social, economic, or environmental objectives. "Technology tiers" and "credit multipliers" are the primary approaches used to meet these objectives. A technology tier carves out a portion of the overall RPS obligation for a subset of eligible technologies. These technologies may be viewed as crucial for renewable policy objectives but less competitive due to higher cost, greater technical difficulty, or other market barriers. For example, New Jersey has a PV tier that requires, by 2008, that 0.17% of retail sales be supported by in-state solar RECs issued for PV projects.

  The most common resource tier approaches taken to date include a: (1) single tier for new resources, (2) single tier for existing and new resources, and (3) multiple-tier RPS differentiated by the vintage, fuel, or technology of the renewable resource.

  Credit multipliers, such as those used in Arizona for solar PV, provide more than 1 MWh of credit for each MWh of generation. New Mexico and Nevada use a similar approach. Credit multipliers increase the economic incentive for developers to install the specific technology that is granted the additional credit.

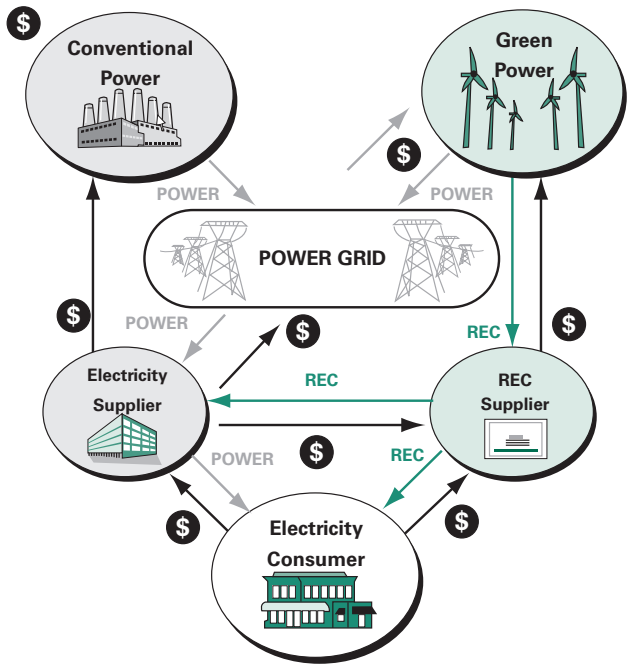
- *Start Dates and Amount of Renewable Energy.* A target percentage of renewable energy is a key element of an RPS. As shown in Figure 5.1.4 on page 5-6, these targets vary from 1% to 30% and are influenced by many factors, including a state's goals, renewable energy potential, and definition of eligible technologies and resources. States establishing provisions for ramping up to the specified target of renewable energy is important. Every state will have unique economic, environmental, and policy factors that lead to creation of a best fit approach. States have found that since there are no absolutes, careful analysis and modeling of the expected impacts before establishing the targets are the keys to success.

Administration

When considering how the RPS requirements will be administered, some key issues include:

- *Accounting.* It is important to regularly account for the renewable energy generated and to determine compliance with RPS requirements. Many states use RECs to determine compliance. These states include New Mexico, Massachusetts, Connecticut, Maine, New Jersey, Texas, and Wisconsin, among others. REC trading is permissible in all but four states where RPS requirements apply. These four states require bundled renewable energy (i.e., energy with attributes intact) to demonstrate compliance. (See Figure 5.1.6 for more detail on RECs and their interaction in power markets.)
- *Flexibility Mechanisms.* Because retailers may face difficulties in complying with a renewable energy purchase obligation, states are developing mechanisms that allow retailers flexibility. These

Figure 5.1.6: Illustration of Renewable Energy Credits (RECs) and Power Markets



Description of Diagram

- Green power generator produces electric power, which is delivered to the power grid and sold in the wholesale spot market.
- Green power generator is awarded RECs and sells them to an REC supplier. RECs convey the right to claim the environmental and other attributes of the green power for regulatory or marketing purposes.
- REC supplier retails some RECs directly to the consumer as a REC-based green product; no energy is sold.
- REC supplier wholesales some RECs to a retail electricity supplier, who needs them to meet RPS requirements; no energy is sold.
- Electricity supplier sells retail electricity to consumer. RPS-eligible RECs obtained by the supplier define the percentage of the electricity that is deemed renewable for RPS purposes.

Note: Conventional power is sold predominately using bilateral contracts and passes through the power grid transmission; it is easier to sell green power into the wholesale spot market. (Both are represented in this diagram within "Power Grid.")

Source: Adapted from EPA 2004.

mechanisms can allow a retail supplier to receive credit for renewable energy generated before the compliance date (e.g., credit for early compliance, forward compliance banking, REC banking) and some flexibility when compliance is not met by the specified date (e.g., deficit banking, true-up period).

- *Cost Recovery.* Renewables can command a premium cost in the marketplace. However, recent increases in natural gas and coal prices and improvements in renewable technology have negated some of the premium to the point that renewable energy is now cost-effective in some regions. Retail suppliers will buy RECs, develop renewable generation, or enter into power purchase agreements (potentially at above-market rates) to be compliant with RPS requirements. Therefore, RPS requirements generally have a mechanism to enable the utility to pass eligible costs on to retail customers via existing rate structures or by a new surcharge to utility bills. In some states, system benefits charge (SBC) funds may also be used to support utility cost recovery. Competitive retail supplier rates are not regulated by PUCs, and therefore, suppliers will need to recover their costs through the rates that they charge to their customers who are subject to competitive market conditions.

  Some, but not all, RPS rules prohibit the sale of voluntary, premium-priced green power by the retail supplier as a means of compliance with RPS requirements. This policy reflects the perspective that voluntary green power sales are intended to have an impact by being incremental to RPS requirements, and not simply offset sales that otherwise would have occurred and been paid for by all customers under the RPS. For example, the New Jersey statewide green power program contains language that specifically prohibits the sale of RECs used for RPS compliance in green power programs, and vice versa. For more information on the interaction between RPS and green power markets, see Section 5.5, *Fostering Green Power Markets*.
- *Cost Caps.* Because of the uncertainty about how the renewable energy market will function in the future, cost caps may be used to impose an upper bound on ratepayer impacts. They also limit potential market abuses and create a fair and efficient alternative compliance mechanism for suppliers if the renewable energy market is underdeveloped. Depending on how it is designed, a cost cap may put a ceiling on the price of renewable energy or RECs. Generally, effective caps are low enough to

limit ratepayer impacts, but high enough to encourage renewable energy development.

As an example, Massachusetts established an ACP so that any retailer under RPS compliance could choose, if necessary, to make some of its renewable energy obligation through a payment to the state rather than by obtaining renewable energy. The ACP thus functions as a cap on retailers' exposure to potentially high renewable energy prices. The ACP is set for each calendar year by the Massachusetts Division of Energy Resources (DOER). In 2005, the ACP was set at $53.19 per MWh. The ACP is paid to the Massachusetts Technology Collaborative (MTC), which can use the payments to encourage renewable energy project development in the state.

When used, ACPs typically reflect an inadequate supply of eligible renewables vis-à-vis RPS requirements and are generally recoverable by regulated utilities from the customers. On the other hand, noncompliance penalties, which may reflect willful disregard for the RPS requirements (e.g., failure to file compliance documentation), are typically not recoverable for utility providers.

Interaction with State and Federal Programs

States coordinate and leverage their RPS requirements with an array of federal and state programs and policies. States have found that analysis of regional renewable resources and RPS requirements are helpful in designing their RPS. Exploring in advance how RPS requirements interact with both state and federal policy will avoid implementation pitfalls.

Interaction with Federal Policies/Programs

- *Production Tax Credit (PTC).* Originally enacted in the 1992 Energy Policy Act (EPAct 1992), the PTC provides a tax credit for qualifying forms of renewable energy production, such as wind, biomass, geothermal, solar, and other technologies. The PTC is currently authorized through the end of 2007 and provides 1.9 cents per kWh for wind for the first 10 years of the wind farm's commercial operation. The PTC has lapsed three times[19] since first enacted, and these lapses resulted in significant decreases in project completions during those periods. State RPS requirements can be designed to provide the flexibility to accelerate or delay renewable procurement to take advantage of short-term PTC expiration or extension.
- *Transmission Facility Extension Costs.* Many large wind farms developed in recent years have required significant and costly transmissions system extensions or upgrades to facilitate grid connection. The Federal Energy Regulatory Commission (FERC) has ratemaking jurisdiction over interstate transmission facilities. Transmission line extensions can be rather costly for remotely sighted wind turbines. Whether transmission interconnection facilities are "rolled in" and paid by all system users or are assigned specifically to the new generators could significantly influence RPS compliance.
- *Proposed Federal RPS.* In the 2005 congressional session, there were bills and amendments to create a national RPS. In June 2005, the U.S. Senate, in a 52-48 vote, adopted a proposal aimed at increasing the amount of electricity that utilities generate using renewable sources. The proposal would require 10% of the power that utilities sell to the retail market to come from renewable sources.

Interaction with State Policies/Programs

- *Existing State Incentives.* A review of existing state incentives for renewable energy can identify opportunities where existing policies and programs could further support RPS requirements. For example, SBC funds targeted for renewable energy in New York, New Jersey, and Massachusetts are used to subsidize design studies or actual installation costs of projects which help meet RPS targets. In contrast, funds in Minnesota and Wisconsin are allocated to renewable energy projects that are incremental to RPS requirements. For more information on SBCs, see Section 5.2, *Public Benefits Funds for State Clean Energy Supply Programs.*

[19] (1) Expired on 6/30/99, extended in 12/99, (2) expired on 12/31/01, extended in 2/02, and (3) expired on 12/31/03, extended in 10/04.

- *Utility Regulation.* In states with a restructured electricity sector, the rules surrounding how default service is provided can affect the market for RECs. In many cases, default service providers cannot enter into long-term contracts for power supplies or purchases of RECs. This limits the ability of renewable energy developers to secure project financing, which typically requires a sufficient long-term revenue stream to ensure adequate debt coverage ratios used by project financiers.
- *Interconnection Requirements.* Renewable electricity generators usually are interconnected with the utility grid to access wholesale markets and find customers of the highest value. Some states have taken great strides in recent years to prepare for implementing RPS requirements by ensuring that interconnection rules are designed to ensure safety while avoiding excessive costs or technical requirements that can be an obstacle to RPS compliance. For more information, see Section 5.4, *Interconnection Standards*.
- *State Emissions Regulations.* State environmental regulators can review the interaction between emission rules and RPS requirements. At least six states grant nitrogen oxide (NO_x) emission allowances or other emission credits, which may have notable market value, to renewable energy projects. Some states have expressly prohibited eligible RPS resources from selling emission allowances or credits they obtain through state environmental incentive programs. Other state RPS rules are silent on this issue. If emission credits can be sold separately (and not invalidate the use of the resource for purposes of meeting RPS requirements), the cost of compliance with the RPS requirements may be reduced due to the additional revenue stream available to renewable energy project owners. Alternately, RPS requirements are intended to produce environmental benefits, and emission allowances and credits therefore remain "bundled" with renewable electricity eligible under RPS requirements and may not be sold separately.

RPS Design Choices and Approaches

Many innovations and best practices can be found in state RPS. A sampling of noteworthy elements in these rules is shown below. Additional state cases are shown in the *State Examples* section on page 5-14.

- *REC Trading.* Texas was the first state to adopt the use of RECs for compliance verification and development of an efficient renewables market. Texas regulators also saw RECs as complementary to their efforts at restructuring the broader electricity market. The use of RECs for RPS requirements and other voluntary markets is now becoming typical in state RPS rules.
- *Centralized Procurement.* New York is the first and only state thus far where a state agency, rather than the utility or retail supplier, is responsible for procuring the renewable energy attributes. In New York, the distribution utility collects a surcharge on electricity delivered to each customer. The funds are turned over to the state. The New York State Energy Research and Development Authority (NYSERDA) then uses the funds to purchase the renewable attributes by soliciting bids from developers.
- *Stakeholder Review.* After Massachusetts adopted legislation mandating RPS requirements, the

Best Practices: Designing an RPS

The best practices identified below will help states design an RPS. These best practices are based on the experiences of states that have RPS requirements.

- Develop broad support for an RPS, including top-level support of the governor and/or legislature.
- Clearly articulate all RPS goals and objectives, since these will drive RPS rules and structure.
- Specify which renewable energy technologies and resources will be eligible, driven by the stated goals and objectives. Also consider state and regional resource availability if a goal/objective is to encourage resource diversity through a technology tier. Then, determine the mix and amount of renewable energy desired.
- Finally, consider using energy generation (not installed capacity) as a target, establish a long timeline to encourage private investment, make compliance mandatory for all retail sellers, make enforcement credible, allow utility cost recovery, establish cost caps, and consider flexible compliance mechanisms.

Massachusetts DOER (the implementing agency) conducted an extensive stakeholder consultation process and commissioned a wide-ranging analytical review of design issues related to RPS requirements. This review process led to the creation of 12 white papers on key RPS requirement topics with key insights and analytical support for eventual design choices (MA DOER 2002).

- *Technology Tiers.* The Arizona RPS requirements (called an Environmental Portfolio Standard), created in 2001, was one of the first RPS to establish a technology tier approach. Arizona mandated that at least 50% of renewable energy requirements come from solar electric sources as of 2001 and 60% by the 2004–2012 time frame. A number of states have followed suit and have used technology tiers in subsequent development of RPS requirements.

Program Implementation and Evaluation

This section provides an overview of implementation and evaluation of RPS requirements.

Roles and Responsibilities of Implementing Organization

The state entity enacting RPS requirements (e.g., the state legislature) will want to name one agency as the primary implementation authority. A number of agencies and organizations will likely be involved in the implementation regardless of which agency is named as lead. These include:

- *State PUCs* will be involved in enforcing RPS requirements and overseeing cost and ratepayer issues.
- *State Energy Offices* or similar State Public Benefit Corporations (e.g., NYSERDA) and quasi-public agencies (e.g., MTC or Connecticut Innovations Incorporated [CII]) may be involved in siting and permitting of new facilities or identifying existing facilities that could help meet RPS requirements. These agencies may also be involved in "making the market" by providing support to emerging REC markets and administering system benefits funds that are targeted toward enhancing compliance with RPS requirements.
- *Independent System Operators (e.g., Texas/Energy Reliability Council of Texas [TX/ERCOT]) or Regional Transmission Operators* may be involved in administering RECs or contracts related to compliance.

Best Practices: Implementing an RPS

The best practices identified below will help states implement an RPS. These best practices are based on the experiences of states that have implemented an RPS.

- Identify the most appropriate "lead" agency or organization for implementation authority of the RPS.
- Establish a transparent and easy-to-use accounting system for compliance.
- Provide retail suppliers with some flexibility in their compliance.
- Make sure a credible noncompliance mechanism is in place in the form of penalties.
- Conduct a mid-course performance review and enact modifications if warranted and if consistent with the original intent of the RPS.

Evaluation

Ongoing evaluation of RPS requirements is key to their success. The enabling legislation for RPS requirements sometimes includes provisions for annual or periodic evaluation and reporting of progress. Massachusetts, for example, requires an annual report. In some states, evaluations have identified serious implementation problems that have necessitated mid-course corrections. Examples of modifications that states have made to existing RPS rules are presented as follows.

- *Arizona* developed an Environmental Portfolio Standard (EPS) in 2001 that required 1.1% renewable energy by 2007, 60% of which was to come from solar. Based on the findings of the Cost Analysis Working Group and a series of workshops, the Arizona Corporation Commission staff determined that the Arizona EPS requirements were inadequate and could be increased significantly.

Challenges: Potential Market Constraints on Meeting RPS Supply

Private sector development of renewable energy projects, which may be necessary to meet a state's RPS requirements, could be constrained without access to private finance and long-term REC contracts. There are two factors that may hinder finance for renewable energy projects in deregulated markets.

1. Short-term power supply contracts

Problem: Default service providers are often limited by restructuring rules to short-term contractual arrangements for purposes of securing default service power supply and RECs. However, a developer might be required to have a long-term power contract in order to obtain private finance.

Potential Solution: In order to facilitate private investment in renewable energy projects, state regulators may want to change the way default service providers contract for power, allowing default service providers to enter into long-term service contracts from renewable generators. In order to limit the service provider's price risk, regulators could limit this policy to a relatively small percentage of total default service load. One approach is emerging in New Jersey, where regulators have included a defined percentage of renewable energy for RPS compliance in their three-year Basic Generation Service Auctions.

2. Uncertainty of REC market

Problem: Market players, such as utilities and competitive ESPs, are reluctant to enter into long-term contracts for RPS compliance RECs. This may be explained by limitations imposed on utilities in their purchase of long-term energy supplies or RECs, or uncertainties about the permanence of existing RPS provisions.

Solution: Since instilling investor confidence in the REC market is critical for developing new renewable energy projects, states could find ways to offer renewable energy project developers long-term REC contracts. One approach implemented by the Massachusetts Renewable Energy Trust (MRET) in 2003 is to use SBC funds for establishing REC contracts of up to 10 years for RPS-eligible projects. In this manner, the state is offering project developers bankable, long-term revenue from an investment grade entity (a state agency with money in escrow). (See RET 2006.)

Source: Navigant 2005.

In 2004, the staff proposed amendments that would raise the EPS requirements to 5% by 2015 and 15% by 2025, 20% of which would come from solar and 25% of which would come from distributed generation (DG).

- *Connecticut* initially exempted utility default service from the RPS requirements. Because most customers remained on default service, revisions to the RPS requirements, which were enacted in June 2003, changed the rules to require all retail suppliers to comply with the RPS requirements.

While scheduled policy evaluations are important, experience has shown that altering RPS policy midstream without sufficient justification or consistency with the original legislative intent of the RPS can hinder the program. The danger is that, if long-term certainty and stability in the policy is lacking, then facility developers and regulated retail providers may delay plans and projects and fail to deliver the results intended by the RPS.

State Examples

The following state examples illustrate the diverse types of RPS requirement design approaches, policy objectives, and implementation strategies that states have deployed. Each example highlights a particular design issue or policy objective. For projected new renewable capacity attributable to existing RPS requirements, see Figures 5.1.1a and 5.1.1b on page 5-3.

Arizona

The Arizona Corporation Commission (ACC) developed an EPS, which took effect in March 2001. The EPS requires regulated utilities to generate a certain percentage of their electricity using renewable energy.

The eligible technologies include solar PV, solar water heating, solar air conditioning, landfill gas, and biomass. Unlike many other RPS requirements around the country, the nonsolar portion of Arizona's EPS is limited strictly to in-state resources. The Arizona EPS illustrates RPS requirements built on very aggressive technology tiers (e.g., the solar set-aside component)

that recognize the important system-wide benefits that solar technologies can provide. Initially, it was proposed that solar would make up 60% of the total renewables requirement from 2004 to 2012. Due to heavy reliance on solar PV, which can be a more costly renewable resource than others in the EPS, the overall renewables requirement is lower as a percentage of total generation when compared to RPS requirements of other states. Initially, the EPS target between 2007 and 2012 for renewable electricity generation was 1.1%. However, ACC staff proposed amendments in 2005 to increase the EPS to 5% by 2015 and 15% by 2025, with 20% of that requirement to be met using solar. The continuing emphasis on solar technologies for a substantial part of the overall RPS target is raising some concerns about the ability of utilities to meet the RPS requirements within prescribed ratepayer funding mechanisms.

Web site:
http://www.cc.state.az.us/utility/electric/environmental.htm

California

The legislation for California's RPS requirements was enacted in September 2002. California's RPS requirements are among the most aggressive in the country, since they require retail sellers of electricity to purchase 20% renewable electricity by 2017. At a minimum, retailers must increase their use of renewable electricity by 1% each year. California is considering increasing its RPS requirements to 33% in 2020.

Although there are some restrictions, the following technologies are eligible under the RPS: biomass, solar thermal, solar PV, wind, geothermal, fuel cells using renewable fuels, small hydropower (< 30 MW), digester gas, landfill gas, ocean wave, ocean thermal, and tidal current. In some cases, municipal solid waste is also eligible.

The legislation for the RPS requirements directs the California Energy Commission (CEC) and the California Public Utilities Commission (CPUC) to work together to implement the RPS requirements and assigns specific roles to each agency. Currently, investor-owned utilities are required to participate (as are ESPs, once the rules are established); municipal utilities are mandated to implement and manage their own initiatives related to increasing renewable energy in their energy portfolios.

Given the financial position of the distribution utilities in the state following the energy crisis in 2000, subsequent legislation offered production incentives (referred to as supplemental energy payments) for the above-market costs of eligible procurement by investor-owned utilities to fulfill their obligation related to RPS requirements.

Web site:
http://www.energy.ca.gov/portfolio/index.html

Massachusetts

The drafting of Massachusetts' RPS requirements began as a result of electric utility restructuring in 1997. In April 2002, the Massachusetts DOER finalized the regulation. In 2003, the DOER required retail electric suppliers to use 1% renewable energy in their overall supply. By 2009, retail electric suppliers must reach 4%, after which the RPS requirements will increase 1% each year until the DOER determines that additional requirements are no longer necessary. The percentage requirements do not translate into hard MW as they are based on the suppliers' overall supply.

Eligible technologies include: solar, wind, ocean thermal, wave, tidal, fuel cells using renewable sources, landfill gas, and low emissions and advanced technology biomass. Existing renewable facilities are allowed, as long as they were installed after 1997. However, if they comply with all technical criteria, facilities installed before 1997 can obtain a waiver that qualifies the quantity of their electricity output each year that exceeds their historical generation rate.

To reduce the risk to retail suppliers associated with acquiring affordable renewable energy, the DOER allows retailers to submit an ACP as an alternative to purchasing or generating renewable energy. The price of the ACP is set annually (e.g., $53.19 per MWh in 2005).

Web site:
http://www.mass.gov/doer/rps/index.htm

Texas

Texas was among the first states to establish RPS requirements and is considered by many policymakers and advocates to be among the most successful. Since Texas passed an RPS in 1999, 1,187 MW of renewable energy capacity has been installed in Texas as of February 2005.

The Texas Renewable Generation Requirement (RGR), issued by the Texas Public Utility Commission in 1999, requires that 2,000 MW of new capacity be installed by 2009. Texas initially used a total capacity requirement (MW), which the Texas PUC later converted into a generation requirement (MWh). Texas allocates a share of the mandated new renewable generation to all retail suppliers based on a prorated share of statewide retail energy sales.

The Texas RPS requirements have been successful in part because of good renewable energy resources in the state. However, success also resulted from key provisions in the legislation, including: (1) high renewable energy requirements that triggered market growth in the state, (2) use of RECs for meeting targets, (3) credible penalties for noncompliance, and (4) inclusion of all electricity providers.

The qualifying resources include: solar, wind, geothermal, hydroelectric, wave or tidal, biomass, and biomass-based waste products (e.g., landfill gas).

The PUC in Texas established a REC trading program. A penalty system also exists. Fines are set at the lesser of $50/MWh or 200% times the average cost of REC for the year.

The RPS requirements include all retail energy providers if they have opted into retail competition (i.e., investor-owned utilities, competitive energy service providers, municipal utilities, and cooperative utilities). Otherwise, they are exempt. This requirement differs from those of many other states that often make participation by public power entities optional.

Texas has changed transmission rules to accommodate the amount of wind power developed as a result of the RPS requirements. It should be noted that there are ongoing transmission line questions, focusing on the cost to upgrade and add lines, surrounding the RPS (ERCOT 2005).

The RPS requirements have had clear positive economic impacts on the state. The tax base in the rural west has grown as a result of more than $1 billion of new wind development. This new source of local income provides much-needed resources for local services, including schools, hospitals, and emergency services. The RPS requirements have also supported hundreds of manufacturing jobs and other opportunities related to the wind industry statewide.

Web site:
http://www.puc.state.tx.us/rules/subrules/electric/25.173/25.173ei.cfm

Wisconsin

In 1999, the Wisconsin legislature established an RPS requiring investor-owned electric utilities, municipal electric utilities, and rural electric cooperatives (electricity providers) to meet a gradually increasing percentage of their retail sales with qualified renewable resources. Wisconsin's RPS requirements went into effect in October 1999 and require 2.2% renewable supply by the end of 2011. As of early 2005, Wisconsin had already secured enough renewable energy to meet their requirements through 2011.

The enabling legislation expressly allows Wisconsin electricity providers the option of using Renewable Resource Credits (RRCs) in lieu of providing renewable electricity to their customers. An RRC trading system is in operation and there is a penalty system for violations.

Eligible technologies include fuel cells that use renewable fuel, tidal or wave power, solar thermal electric, solar PV, wind power, geothermal electric, biomass, and hydropower (< 60 MW).

Wisconsin is considering increasing its RPS requirements, and studies show that the state has adequate renewable sources to make this a reasonable objective.

Web site:
http://psc.wi.gov/

What States Can Do

Action Steps for States

RPS accelerates the development of renewable and clean energy supplies. Benefits include a clear and long-term target for renewable energy generation that can increase investors' and developers' confidence in the prospects for renewable energy. States have chosen from a wide variety of approaches and goals in developing their RPS requirements. The "best practices" common among these states have been explored above. Action steps are outlined below.

States with existing RPS requirements have made it a priority to identify and mitigate issues that might adversely impact the success of the program. The longevity and credibility of the RPS requirements is crucial for investment in new renewable projects. More specifically, states with existing RPS requirements can:

- Monitor the pace of installing new renewable projects to ensure that the renewable resources needed to meet RPS goals will be in place. If adequate resource development is lagging, identify the reasons for any delay and explore possible mitigation options. For example, adequate transmission planning and policies often present obstacles to successful RPS implementation.
- Monitor utility and retail supplier compliance and the impact on ratepayers. Any significant, unanticipated adverse impacts on ratepayers can be addressed through implementing or adjusting cost caps or other appropriate means.
- Evaluate the scope of eligible technologies and, as needed, consider adding eligible technologies or altering the percentage requirements. At the same time, it is important to recognize that long-term stability and certainty of policy are important and frequent changes may undermine the success of RPS requirements.

Broad political and public support for establishing renewable energy goals have been an important part of establishing RPS requirements. Many states have found that after establishing general support for goals, it is helpful to hold facilitated discussions among key stakeholders regarding appropriate RPS design. More specifically, states that do not have existing RPS requirements can:

- Establish a working group of interested stakeholders to consider design issues and develop recommendations for RPS requirements.
- Analyze costs and benefits as in New York and Texas.
- Publicize RPS goals as they are reached to ensure that state officials, pubic office holders, and the public know that the RPS requirements are working and achieving the desired results.

Related actions that states can take include:

- Consider the need for additional policies or regulations that will help make RPS requirements successful. Transmission-related policies have proven to be critical to the success of large wind farms that are some distance from load centers and require transmission line extensions or upgrades. Ratemaking provisions that allow such upgrades to be treated as general system investments, which are funded by all users of the transmission system, help alleviate significant cost hurdles that can impede otherwise excellent wind projects.
- Consider adopting (or improving) net metering and interconnection standards to facilitate customer-sited clean DG projects that may be eligible technologies under an RPS.

Information Resources

General Information

Title/Description	URL Address
Evaluating Experience with Renewables Portfolio Standards in the United States. Wiser, R., K. Porter, and R. Grace. Prepared for the Conference Proceedings of Global Windpower. Chicago, IL: March 28-31, 2004. Ernest Orlando Lawrence Berkeley National Laboratory (LBNL), Berkeley, CA. LBNL-54439. This document provides a comprehensive analysis of U.S. experience with RPS, including lessons learned.	http://eetd.lbl.gov/EA/EMP/reports/54439.pdf
Interwest Energy Alliance Benefits of Renewable Energy. Interwest Energy Alliance is a trade association that brings the nation's wind energy industry together with the West's advocacy community. This document provides the answers to some questions about renewable energy, including economic and environmental benefits.	http://www.interwestenergy.org/benefits.htm
Projecting the Impact of RPS on Renewable Energy and Solar Installations. Wiser, R. and K. Bollinger. January 20, 2005. This PowerPoint presentation estimates and summarizes the potential impacts of existing state RPS on renewable energy capacity and supply, and of state RPS solar set-asides on solar PV capacity and supply.	http://www.newrules.org/de/solarestimates0105.ppt
Union of Concerned Scientists. Plugging in Renewable Energy: Grading the States. This report assigns grades to each of the 50 states based on their commitment to supporting wind, solar, and other renewable energy sources. It measures commitment by the projected results of renewable energy.	http://www.ucsusa.org/clean_energy/clean_energy_policies/plugging-in-renewable-energy-grading-the-states.html
Union of Concerned Scientists. Real Energy Solutions: The Renewable Electricity Standards, Fact Sheets. A national renewable energy standard (RES) can diversify our energy supply with clean, domestic resources. It will help stabilize electricity prices, reduce natural gas prices, reduce emissions of carbon dioxide and other harmful air pollutants, and create jobs—especially in rural areas—and new income for farmers and ranchers. This fact sheet provides an overview of RES.	http://www.ucsusa.org/clean_energy/clean_energy_policies/real-energy-solutions-the-renewable-energy-standard.html
Union of Concerned Scientists. Renewable Electricity Standards at Work in the States. In a growing number of states, RES—also called RPS—have emerged as an effective and popular tool for promoting a cleaner, renewable power supply. This fact sheet gives an overview of some state RES.	http:www.ucsusa.org/clean_energy/clean_energy_policies/res-at-work-in-the-states.html

Information About Federal Resources

Title/Description	URL Address
EPA CHP Partnership. This is a voluntary program that seeks to reduce the environmental impact of energy generation by promoting the use of CHP. The Partnership helps states identify opportunities for policy developments (energy, environmental, economic) to encourage energy efficiency through CHP. The Partnership can provide information and assistance to states considering including CHP or waste heat recovery in their RPS requirements.	http://www.epa.gov/chp/
EPA Green Power Partnership. This program provides assistance to renewable generators in marketing RECs and helps educate potential REC buyers about resources. The Partnership may be of assistance to states that employ RECs as a compliance measure for their RPS requirements but also allow for purchase and retirement of RECs for organizational "green power" designation.	http://www.epa.gov/greenpower

Information on Selected State Programs

State	Title/Description	URL Address
Arizona	**Arizona Corporation Commission (ACC) Environmental Portfolio Standard Developments**. This site is the ACC archive on RPS rules, suggested amendments, workshops, and public comment.	http://www.cc.state.az.us/utility/electric/environmental.htm
California	**California Energy Commission (CEC) Renewables Portfolio Standard**. This site provides an overview of the California RPS and a link to Senate Bill 1078.	http://www.energy.ca.gov/portfolio/index.html
Massachusetts	**Massachusetts Division of Energy Resources (DOER): Renewable Portfolio Standard Web Site**. This Web site provides an archive on the state's RPS requirements, rulings, and subsequent actions.	http://www.mass.gov/doer/rps/index.htm
	Massachusetts DOER: RPS Papers and Reports. This DOER Web site provides links to white papers that served as a basis for discussion of RPS design and implementation issues.	http://www.mass.gov/doer/programs/renew/rps.htm#papers
	Massachusetts DOER: Renewable Portfolio Standard, RPS Annual Reports. The RPS regulations (at 225 CMR 14.10(2)) require DOER to issue an Annual Energy Resource Report summarizing certain information from the Annual Compliance Filings.	http://www.mass.gov/doer/rps/annual.htm
	Massachusetts Technology Collaborative. **Renewable Portfolio Standard**. This Web site describes the components of the state's RPS and provides a link to information about renewable energy certificates that are a tool for implementing the RPS.	http://www.masstech.org/cleanenergy/policy/rps.htm
New York	**New York State Public Service Commission: Retail Renewable Portfolio Standard**. This site provides an archive of documents on New York RPS requirements.	http://www.dps.state.ny.us/03e0188.htm
Texas	**Public Utility Commission of Texas: Goal for Renewable Energy**. This site provides the Texas PUC's archive of documents on RPS requirements.	http://www.puc.state.tx.us/rules/subrules/electric/25.173/25.173ei.cfm
	Transmission Issues Associated with Renewable Energy in Texas. Informal White Paper for the Texas Legislature, 2005. This document provides data for consideration by legislators in evaluating bills to expand the Texas RPS.	http://www.ercot.com/news/presentations/2006/RenewablesTransmissi.pdf
Wisconsin	**Evaluating the Impacts of Increasing Wisconsin's Renewable Portfolio Standard. University of Wisconsin-Madison for the Wisconsin Department of Administration, Division of Energy Renewable Energy Assistance Program**. This study considered the economic impact to Wisconsin of four scenarios for future RPS standards.	http://www.ucsusa.org/assets/documents/clean_energy/UW_RPS_Final_Report_10-31-03.pdf

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Title/Description	URL Address
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EPA. 2004. Guide to Purchasing Green Power. Produced in a joint effort between EPA, DOE, the World Resources Institute, and the Center for Resource Solutions. September 2004, p. 10.	http://www.epa.gov/greenpower/pdf/purchasing_guide_for_web.pdf
ERCOT. 2005. Transmission Issues Associated with Renewable Energy in Texas. Informal White Paper for the Texas Legislature, 2005. Produced in a joint effort between the industry and the ERCOT Independent System Operator (ISO).	http://www.ercot.com/AboutERCOT/TexasRenewableWhitePaper2005/RenewablesTransmissionWhitePaperFINAL.pdf
MA DOER. 2002. Massachusetts DOER RPS Policy Analysis has a series of white papers that cover many topics related to RPS requirements in great detail. The papers were developed during the creation of the Massachusetts RPS requirements. December 16.	http://www.mass.gov/doer/programs/renew/rps.htm
Navigant. 2005. Company intelligence. Navigant Consulting Inc. Also see: Katofsky, R. and L. Frantzis. 2005. Financing renewables in competitive electricity markets. Power Engineering. March 1.	http://www.navigantconsulting.com/A559B1/navigantnew.nsf/vGNCNTByDocKey/PPA91045514813/$FILE/Financing%20Renewables%20in%20Competitve%20Electricity%20Markets_Power%20Engineering_March%202005.pdf
Petersik, T. 2004. State Renewable Energy Requirements and Goals, Status through 2003. U.S. EIA. July.	http://www.mass.gov/doer/programs/renew/rps.htm
Rader, N. and S. Hempling. 2001. The Renewables Portfolio Standard: A Practical Guide. Prepared for the National Association of Regulatory Utility Commissioners. February.	http://www.naruc.org/displayindustryarticle.cfm?articlenbr=15688&searchcriteria=Renewable%20Portfolio%20Standard&securetype=All&startrec=1
RET 2006. Renewable Energy Trust Web site. Massachusetts Green Power Partnership.	http://www.masstech.org/RenewableEnergy/mgpp.htm
Wiser, R. 2005. An Overview of Policies Driving Wind Power Development in the West. Ernest Orlando LBNL, Berkeley, CA. February.	http://www.nationalwind.org/events/transmission/western/2005/presentations/Wiser.pdf